

"DETERMINATION OF RAINFALL/RUNOFF
MODEL PARAMETERS"

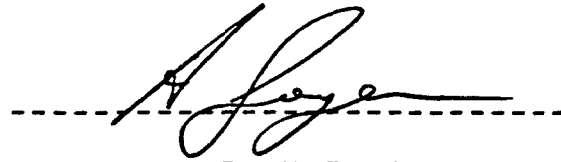
A. G. GOYEN

Submitted in fulfilment of the requirements for the
Master of Engineering Degree at the New South Wales Insti-
tute of Technology.

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CERTIFICATION STATEMENT

I hereby declare that the content of this thesis does not comprise any work or material which I have previously submitted for a Degree or other similar award from any other Institute of Technology or University.

A handwritten signature in black ink, appearing to read 'A. Goyen', is written over a horizontal dashed line.

Allan G Goyen B E. MIE. Aust.

ABSTRACT

"DETERMINATION OF RAINFALL/RUNOFF MODEL PARAMETERS"

KEY WORDS: Stochastic-Deterministic,
Rainfall/Runoff Models. Joint Probability, Antecedence,
Parameters-Field Measurements.

ABSTRACT: Runoff estimates both peaks and volumes are called for in design analysis for the sizing of a wide range of engineering structures. In many instances runoff records are very short or not available and it is necessary to use synthetic rainfall data and apply a rainfall/runoff model to estimate appropriate design hydrographs. This thesis addresses the particular portion of the rainfall/runoff process conversion dealing with the development of excess hyetographs prior to catchment routing and the estimation of the parameters affecting such development. Details are given on field based parameter estimating procedures as well as further model development to better reflect measurable input parameters. A joint probability model linking moisture deficiency criteria prior to an event, rainfall data and measured catchment parameters is developed and applied on Canberra data.

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TABLE OF CONTENTS

ABSTRACT	Page
ACKNOWLEDGEMENTS	iv
LIST OF FIGURES	v
LIST OF TABLES	viii
LIST OF PHOTOGRAPHS	x
LIST OF SYMBOLS	xi
	xii

Chapter

1	INTRODUCTION	1
2	BACKGROUND AND SCOPE OF THESIS	3
	2.1 Description of RSWM	4
3	FIELD DATA COLLECTION AND ANALYSIS	10
	3.1 Introduction	10
	3.2 Study Catchments	15
	3.2.1 Giralang and Gungahlin	15
	3.2.2 Mawson	17
	3.2.3 Black Mountain Reserve	17
	3.3 Scope of Data Collection Program	18
	3.4 Description of Sampling Stations	19
	3.5 Sampling Methods	27
	3.5.1 Soil Moisture Profiles	27
	3.5.2 Infiltration Parameters	34
	3.6 Results from Gauging Program	37
	3.6.1 Long Term Soil Moisture Fluctuations	37
	3.6.2 Sorptivity and Hydraulic Conductivity	44
	3.7 Discussion on Results	45

THEORETICAL RAINFALL/RUNOFF MODEL DEVELOPMENT

4.1	Discussion on Current Techniques	47
4.2	Development of a Combined Stochastic-Deterministic Rainfall/Runoff Model	50
4.2.1	General	50
4.2.2	Continuous Water Balance Model Development	56
4.2.2.1	Urban Land Domains	73
4.2.2.2	ARBM Model Results	75
4.2.2.3	Development of an Antecedent Moisture Index	86
4.2.3	Review of Existing Stochastic-Deterministic Models	89
4.2.4	Development of SDRRM Model	92
4.2.5	Results from SDRRM	102
4.3	Parameter Assessment for Ungaged and Gauged Urban Catchments	105
4.4	Runoff Generation from Different Land Domains	106
4.5	Comparative Analysis Employing the SDRRM and Existing Runoff Estimating Procedures	107
4.5.1	Introduction	108
4.5.2	Catchment Data	108
4.5.3	Rational Formula Method of Analysis	109
4.5.4	Regional Flood Frequency Technique	111
4.5.5	Runoff Routing Approach Employing a Design Storm with Initial and Continuing Losses	111
4.5.6	Runoff Routing Approach Employing a Stochastically Derived Rainfall Excess Lumped Catchment	111
4.5.7	Runoff Routing Approach Employing a Stochastically Derived Rainfall Excess-Separate Pervious-Impervious Consideration	112

4.5.8	Direct Application of the SDRRM	112
4.5.9	Frequency Analysis of Gauged Data	112
4.5.10	Discussion on the Methods and their Results	113
4.6	Application of Proposed Parameter Estimating and Modelling Techniques	114
4.6.1	Major Drainage Analysis and Design	114
4.6.2	Minor Drainage Design	115
5	SUMMARY AND CONCLUSIONS	119
5.1	Introduction	119
5.2	Combined Stochastic- Deterministic Urban Drainage Model	120
5.3	Summary	120
5.4	Conclusions	122
6	REFERENCES	123

APPENDICES

APPENDIX A	Engineering Logs Stations Nos 1-8
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LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
2-1	Diagrammatic Sketch of RSWM	6
2-2	Typical Watershed Breakup for Analysis by RSWM	7
3-1	Location of Canberra Study Catchments	11
3-2	Giralang Urban Catchment	12
3-3	Mawson Urban Catchment	13
3-4	Giralang and Gungahlin Paired Catchments	14
3-5	Troxler Surface Moisture/ Density Meter	29
3-6	Scatter Diagram Comparing Nuclear and Conventional Soil Moisture Readings	32
3-7	Shallow Soil Moisture Readings during the 1979/1980 Period	39
3-8	Profile Summaries	40
4-1	Annual Max 30, 60, and 120 Minute Rainfall Bursts and Simulated Runoff 1933-75	53
4-2	Seasonal Distribution of Annual Max 30, 60 and 120 Min. Rainfall Bursts	54
4-3	Canberra Intensity-Frequency Duration, Pan Evaporation and Daily Rainfall Distribution	55
4-4	Diagrammatic Sketch of the ARBM	57
4-5	Sensitivity of ARBM Model Parameters	61
4-6	Gungahlin Scatter Diagrams	77
4-7	Long Term (US) Soil Moisture Simulation	78
4-8	Antecedent Rainfall-Pre Burst Moisture Scatter Diagram for Simulated Max. Ann. Pervious Runoff Events.	84
4-9	Probability Curves for Index Type I	87
4-10	Probability Curves for Index Type II	88
4-11	Diagrammatic Representation of The SDRRM Model	93
4-12	SDRRM Model Output	99
4-13	Flow Diagram of SDRRM Routing Operations	101
4-14	Simulated Excess Rainfall and Runoff Peaks for Different Land Domains	103
4-15	Simulated Excess Rainfall and Runoff Peaks for Giralang	104

4-16	Sensitivity of Runoff Peaks to Land Domains, Giralang Catchment	107
4-17	Comparative Simulations for Mawson	110
4-18	Simulated Total Storm Losses	116
4-19	Simulated Rational Method, Canberra Runoff Coefficients	118

LIST OF TABLES

<u>Table</u>		<u>Page</u>
3-1	Average Sorptivity and Hydraulic Conductivities	45
4-1	Summary of Typically Recommended Initial and Continuing Loss Rates for Australian Conditions	51
4-2	ARBM Parameters Reference Set	60
4-3	Dry Grass Parameter Set	75
4-4	Adopted Domain Based Parameter Sets	79
4-5	Annual Maximum Rainfall (Yarralumla) and Annual Maximum Simulated Pervious Excess Statistics 1933-1970	81
4-6	Maximum Annual Upper Soil Storage Levels 1933-1969	85
4-7	Annual Maximum Gauged Flow Peaks, Mawson.	113

LIST OF PHOTOGRAPHS

<u>Photo</u>		<u>Page</u>
3-1	Giralang Station No. 1 - General View	20
3-2	Giralang Station No. 1 - Strata Details	20
3-3	Giralang Station No. 2 - General View	21
3-4	Giralang Station No. 2 - Strata Details	22
3-5	Giralang Station No. 3 - General View	23
3-6	Giralang Station No. 3 - Strata Details	23
3-7	Giralang Station No. 5 - General View	24
3-8	Giralang Station No. 5 - Showing Initial Nuclear Gauging	24
3-9	Giralang Station No. 6 - General View	25
3-10	Giralang Station No. 6 - General View	25
3-11	Blackmountain Station No. 8 - General View.	26
3-12	Black Mountain Station No. 8 - Detailed Surface View	27
3-13	Installation of Thermocouples Station No. 1	33
3-14	Completed Installation of Thermocouples Station No. 1	33

LIST OF SYMBOLS

A	Subcatchment area in km^2 .
A	Transition Probabilities Matrix.
A	Infiltration parameter (cm/min^1).
Ac	Cross-Sectional area of core (cm^2).
A0,A1	Redistribution Parameters.
API5	Five day antecedent prec. index.
B	Subarea coefficient.
B	Infiltration parameter ($\text{cm}/\text{min}^{3/2}$).
b_{jik}	Conditional probability of Q_{oj} given R_i and M_k .
CAPIMP	Impervious store capacity.(mm).
CWI	Catchment Wetness Index.
C	Rational Method Runoff Coefficient.
DS	Pervious Depression storage.(mm).
DSC	Depression store capacity.(mm).
D	Diameter of soil core.(mm).
D(wet)	Wet density.(g/mm^3) and (g/cm^3).
D(dry)	Dry density.(g/mm^3) and (g/cm^3).
ER	Proportion of transpiration from US.
ECOR	Ratio of Pot. Evap. to A class pan.
f	Dimension of vector Q_o .
FIMP	Proportion of catchment that is impervious.
GN	Variable rate groundwater recession factor.
GS	Groundwater storage.(mm).
H	Hydraulic head - dist. from base of core to pondage surface.(cm).
i	Cumulative infiltration.(cm).
ISC	Interception store capacity.(mm).
IAR	Proportion of rainfall intercepted by vegetation.
IDS	Impervious depression storage.(mm).
IS	Interception storage.(mm).
I	Rainfall intensity in mm/hr for a return period f_y and duration T_a .
I	Infiltration rate.(mm/hr).
KG	Constant rate groundwater recession factor.
K	Subarea storage delay time in hours.
Ko	Saturated hydraulic conductivity.(cm/min).
L	Length of soil core.(cm).
LSC	Lower soil store capacity.(mm).
LH	Maxrate of water uptake from roots from lower soil store.(mm/day),
LDF	Lower soil drainage factor.
LS	Lower soil storage.(mm).
l	Dimension of vector R.
M_k	Particular value of parameter.
m_k	Probability of M_k .

m	Parameter value.
P(Q)	Peak flow prob. of exceedence.
P(Q, T _i , R _j , I _k)	Conditional probability of Q being exceeded given that T _i , r _j and I _k occur.
p(T _i)	Probability of T _i occurring.
p(V _j)	Probability of V _j occurring.
p(I _k)	Probability of I _k occurring.
Q	Instantaneous rate of runoff in m ³ /s.
Q _w	Volume of water discharged in time t. (cm ³).
Q _o	Vector representing probability distribution of output.
q _o _j	Probability of Q _o _j .
Q _o _j	Particular value of output.
q _o _j	Output variable.
Q(fy)	Peak runoff for return period fy years. (m ³ /s).
R	Vector representing probability distribution of input.
r _i	probability of R _i .
r _i	input variable.
R _i	Particular value of input.
S _i	Main channel slope in %.
S	Sorptivity (cm/min ^{1/2}).
SO	Sorptivity at zero moisture level.
SMD	Soil moisture deficiency.
t	Time (min).
T	Time of concentration.
T _a	Rainfall intensity averaging time.
(1+U)	Urbanisation factor - equals fraction urbanised.
US	Initial moisture content in upper soil store (mm).
UH	Maxrate of water uptake from roots from upper soil store.
USC	Upper soil store capacity. (mm).
V _t	Total volume of soil sample. (mm ³).
V	Basin storage constant for an assumed linear reservoir.
W _w	Weight of water in soil sample (g).
W _s	Weight of dry soil in soil sample (g).
W _t	Total weight of soil sample (g).
W(Vol)	Moisture content by volume. (%).
W(Wt)	Moisture content by weight. (%).
X)	values related to time in infiltration equ.
Y).	